

1 **Claims**

2 Claims 1-7 (canceled)

3 Claim 8. (currently amended) A method to determine the angle β of the second chamber (6) of
4 the improved refractometer cell (9) of Claim 12 when the cell refractive index n_g of the
5 transparent material of said cell is known, comprising the steps of

- 6 A. preparing a ~~solution~~ fluid whose refractive index n_1 is known;
- 7 B. filling both chambers of said refractometer cell with said fluid;
- 8 C. illuminating the cell with a fine beam of light whose vacuum wavelength λ_0 is
9 known,
- 10 D. measuring the angle of deflection ψ of the transmitted beam
- 11 E. calculating β from the relation

$$\sin(\psi) = \frac{n_1 \sqrt{2}}{2} \left\{ \left[1 - \left(\sin^2(\beta) \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right) - 2 \sin(\beta) \cos(\beta) \left(\frac{n_g}{n_1} \right) f \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} + \cos^2(\beta) \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} \right. \right. \\ \left. \left. - \left(\frac{n_g}{n_1} \right) \left[\sin(\beta) \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} - \cos(\beta) \left(\frac{n_g}{n_1} \right) f \right] \right] \right\}$$

12 where
13

$$f = \sin(2\beta)g - \cos(2\beta)(1 - g^2)^{\frac{1}{2}} \text{ and } g = \left(\frac{n_1}{n_g} \right) \{ \cos(\beta) - \sin(\beta) \} \frac{\sqrt{2}}{2}.$$

15 Claim 9. (original) The method of Claim 8 for the case when $\beta \approx 45^\circ$ and n_g is known and said

16 angle β is determined from $\beta = \frac{\sin \psi}{2(n_g - n_1)} + \frac{\pi}{4}$ where said measured deflection angle is ψ .

17 Claim 10. (currently amended) A method for measuring the refractive index of a ~~liquid~~ fluid

18 using the improved refractometer cell of Claim 12 comprising the steps of

- A. filling both chambers of said cell with said ~~liquid~~ fluid;
- B. passing a fine beam of light therethrough;
- C. measuring the deflection angle ψ of the emerging beam;
- D. calculating said refractive index n_1 from the relation

$$\sin(\psi) = \frac{n_1 \sqrt{2}}{2} \left\{ \left[1 - \left(\sin^2(\beta) \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right) - 2 \sin(\beta) \cos(\beta) \left(\frac{n_g}{n_1} \right) f \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} + \cos^2(\beta) \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} \right. \right. \\ \left. \left. - \left(\frac{n_2}{n_1} \right) \left[\sin(\beta) \left(1 - \left(\frac{n_g}{n_1} \right)^2 f^2 \right)^{\frac{1}{2}} - \cos(\beta) \left(\frac{n_g}{n_1} \right) f \right] \right\}$$

$$\text{where } f = \sin(2\beta)g - \cos(2\beta)(1 - g^2)^{\frac{1}{2}} \text{ and } g = \left(\frac{n_1}{n_g} \right) \{ \cos(\beta) - \sin(\beta) \} \frac{\sqrt{2}}{2}.$$

Claim 11. (currently amended) A method for measuring the refractive index difference Δn of two fluids of refractive indices n_2 and $n_2 + \Delta n$, respectively, to first order in $\beta - \frac{\pi}{4}$ and second order in Δn using the improved refractometer cell of Claim 12 comprising the steps of

- A. filling the first chamber (4) with said fluid of refractive index n_2 and the second chamber (6) with said second fluid of refractive index $n_2 + \Delta n$;
- B. measuring the deflection angle ψ of the emerging beam;
- C. calculating Δn from the relation:

$$\sin(\psi) = 2\Delta n \left\{ 1 + \left(1 - \frac{n_g}{n_2} \right) \left(\beta - \frac{\pi}{4} \right) \right\} + 2(n_g - n_2) \left(\beta - \frac{\pi}{4} \right) + \Delta n^2 \left\{ \left(11 \frac{n_g}{n_2^2} - \frac{1}{n_g} - \frac{10}{n_2} \right) \left(\beta - \frac{\pi}{4} \right) - \frac{1}{n_2} \right\}$$

where n_g is the refractive index of said transparent cell.

1 Claim 12. (new) An improved refractometer cell constructed of a transparent material of
2 refractive index n_g and comprising

3 A. a first exterior surface (9) and a second exterior surface (14), said first and second
4 exterior surfaces (9, 14) permitting a light beam (1) to pass therethrough so as to enter
5 and exit, respectively, the refractometer cell, and

6 B. a pair of fluid-containing chambers (4, 6) through which said light beam passes, said
7 chambers (4, 6)

8 1) each forming a cavity which contains at least two plane, non-parallel surfaces (10,
9 11 and 12, 13);

10 2) are separated by a transparent window therebetween;

11 3) contain fluids of refractive index n_1 and n_2 respectively, and;

12 4) are characterized in that said chambers comprise entrance and exit beam-passing
13 plane surfaces (10, 11, 12, 13), at least one of which has no other internal beam-
14 passing surface parallel thereto.

15
16 Claim 13. (new) The improved refractometer cell of Claim 12 further incorporating mirror means
17 (15) adjacent and parallel to said second exterior surface (14) causing the beam transmitted
18 therethrough to be reflected back therefrom through said cell and exiting at said first exterior
19 surface (9), where its angular deviation relative to the direction of said incident light beam (1)
20 may be measured thereat.

21
22 Claim 14. (new) The improved refractometer cell of Claim 12 wherein the sides transverse to the
23 incident beam of each chamber (4, 6) form a triangle.

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2 Claim 15. (new) The improved refractometer cell of Claim 14 wherein said first chamber (4)
3 forms an isosceles right triangle of 45° base angles (α), said second chamber (6) forms a triangle
4 with one 45° base angle (α) and a second angle (β) less than 45° yielding a third angle greater
5 than a right angle, and the hypotenuse (11) of the isosceles right triangle of said first chamber (4)
6 is parallel to the longest side (12) of the triangle of said second chamber (6).